



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF  
PREVENTION, PESTICIDES AND  
TOXIC SUBSTANCES

September 17, 2007

**MEMORANDUM**

**SUBJECT:** HED's Review of "Determination of Dislodgeable Foliar Residues from Corn Treated with Mesotrione 480 SC"; MRID # 471901-01. DP Barcode No. D342621.

**FROM:** Kelly M. Lowe, Environmental Scientist *Kelly Lowe*  
Health Effects Division/Registration Action Branch I (7509P)

**THRU:** PV Shah, Acting Branch Chief *PV Shah*  
Health Effects Division/Registration Action Branch I (7509P)

**TO:** James Stone  
Registration Division / Herbicide Branch (7505P)

Attached is a review of the dislodgeable foliar residue (DFR) study submitted by Syngenta (MRID 471901-01). The primary review was completed by Versar, Inc. on September 13, 2007, under supervision of HED. It has undergone secondary review in the branch and has been revised to reflect Agency policies.

**Executive Summary**

This pilot study was designed to provide dislodgeable foliar residue (DFR) data for mesotrione applied to corn plants. This information was collected to provide data to refine the mesotrione risk assessment for object-to-mouth transfer for children who may come in contact with mesotrione treated residential turf. To collect the DFR data required for a Tier 2 assessment, mesotrione was applied to corn as a surrogate crop for turf grass.

One application of mesotrione 480SC, a suspension concentrate formulation containing 40.2% mesotrione as the active ingredient (ai), was applied post-emergence to corn. The target rate of 8 fluid ounces per acre (0.25 lb ai/A) was the label recommended maximum use rate for use on turf. The application was applied using a research CO<sub>2</sub> backpack handboom sprayer at a target spray volume of 40 gallons per acre. Triplicate DFR samples were collected from the treated plot at 2, 3, 4, 5, 6, 7, 8, 24, 48 and 72 hours after the application. This sampling interval was

chosen in order to determine DFRs during the critical time period immediately after application.

Field fortification samples were prepared the day prior to the application of the test substance to measure the extractability and stability of mesotrione. The overall mean field fortification recovery was 101%. Raw residue values did not require correction for corresponding average field fortification recoveries which were all greater than 90%.

The maximum mean DFR value for corn leaves occurred three hours after the application ( $0.375 \mu\text{g}/\text{cm}^2$ ) and declined to  $0.261 \mu\text{g}/\text{cm}^2$  eight hours after the application. Three quarters of an inch of rain fell soon after the 8 hour sampling interval. The mean DFR then dropped rapidly to  $0.00068 \mu\text{g}/\text{cm}^2$  by the 24 hour sampling interval. The lowest mean DFR occurred at the Day 2 (48-hour) sampling interval ( $0.00054 \mu\text{g}/\text{cm}^2$ ). Residue on the final sampling interval, Day 3 (72 hour), averaged slightly higher at  $0.00077 \mu\text{g}/\text{cm}^2$ .

Rainfall contributed significantly to the rate of decline after the 8-hr sampling interval. To be conservative, the Registrant did not include the sampling data from the samples collected after the rainfall in their regression analysis calculation. Using an exponential decay model and the average residues for each sampling interval, the Registrant estimated a half-life value of 10.5 hours (0.438 days) with an  $R^2$  of 0.9161. Plotting all the individual data points for each sampling interval, Versar estimated a half-life value of 9.1 hours (0.38 days) with an  $R^2$  of 0.30 for corn leaves out to 8-hours after application. This low  $R^2$  value was due to the variability of residue values within each sampling interval.

## Conclusions

The study is acceptable, since it has only minor deficiencies, and meets most of the guideline requirements. The DFR data from this study provide information that can be used to refine the mesotrione risk assessment for object-to-mouth transfer for children who may come in contact with mesotrione treated residential turf. Therefore, these data are acceptable for use in the residential postapplication exposure assessment for mesotrione.

Approximately 14.5% of the application rate was dislodgeable at the 2 hour sampling interval, and 14.6% was dislodgeable at the 3 hour sampling period. As stated by the Registrant, this is less than the EPA default assumption of 20% for children's object to mouth transfer currently used in residential risk assessments (2001, EPA's Scientific Advisory Council – Policy 12).

EPA Reviewer: Kelly Lowe  
[RAB1], Health Effects Division (7509P)

Signature: Kelly Lowe  
Date: 9/17/07  
Template version 02/06

### DATA EVALUATION RECORD

**STUDY TYPE:** Determination of Dislodgeable Foliar Residues from Corn Treated with Mesotrione 480 SC; OPPTS 875.2100

**PC CODE:** 122990

**TEST MATERIAL** Mesotrione 480 SC is formulated as a suspension concentrate containing 40.2% active ingredient, mesotrione.

**SYNONYMS:** Proposed Product Names: Mesotrione 480 SC; Mesotrione 4 SC (FR); Callisto™ (Agricultural market); Outplay™ and Tenacity™ (Turf market); Chemical Names: Mesotrione; 2-(4-Methanesulfonyl-2-nitro-benzoyl)-cyclohexane-1,3-dione (IUPAC); 1,3-Cyclohexanedione, 2-[4-(methylsulfonyl)-2-nitrobenzoyl] (CAS); CAS # 104206-82-8.

**CITATION:** Authors: Richard C. Honeycutt, Ph.D. (Study Director)  
Charles A.S. Pearson, Ph.D.  
Thomas J. Mayer, B.S.  
Title: Pilot Study: Dissipation of Dislodgeable Foliar Residues of Mesotrione 480 SC Formulation Applied to Corn (187 pages).  
Report Date: July 25, 2007  
Analytical Laboratory: Syngenta Crop Protection, Inc.  
410 Swing Rd  
Greensboro, NC 27419  
Identifying Codes: Report Number T002113-07; MRID 471901-01;  
Unpublished

**SPONSOR:** Syngenta Crop Protection, Inc.  
410 Swing Rd  
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This study met most of the Series 875.2100 Guidelines. The following issues of concern are noted:

- The main objective of the study was to determine the percentage of mesotrione that could be dislodged immediately after application, and because only one test site was used in the study only three replicates were examined at each time interval.
- The samples of most concern (those in the first hours after application) required a dilution factor of 400 in order to be quantifiable in the validation range of the method.
- Rainfall (i.e., 0.75 inches) occurred within 9 hours of the application. To be conservative, the Registrant did not use the data collected after the rainfall event in the DFR regression analysis.
- Complete meteorological data were not provided for the duration of the study, such as daily temperature, wind speed, wind direction, and relative humidity.
- The production of metabolites, breakdown products, or the presence of contaminants of concern, was not addressed for mesotrione.
- Control sites should be upwind and a reasonable distance from the treatment site. The location of the control plot relative to the location of the treated plot was not discussed in the Study Report.

#### **COMPLIANCE:**

Signed and dated GLP, Quality Assurance, and Data Confidentiality statements were provided. The study sponsor waived claims of confidentiality within the scope of FIFRA Section 10 (d)1(A), (B), or (C). The Study Report indicated that the study was not conducted under EPA GLPs (40 CFR Part 160). According to the Study Report, the study was conducted under the “spirit” of EPA’s GLPs.

**CONCURRENT EXPOSURE STUDY:** No

**GUIDELINE OR PROTOCOL FOLLOWED:** Series 875, Part B: Dislodgeable Foliar Residue  
Dissipation: Agricultural, Guideline 875.2100.

#### **I. MATERIALS AND METHODS**

##### **A. MATERIALS:**

##### **1. Test Material:**

Formulation: Mesotrione 480 SC is formulated as a suspension concentrate formulation containing 40.2% active ingredient, mesotrione.

Batch/Lot #: ID449543 (A12738A) (formulated product)  
Batch/lot number for reference standard was not provided.

Formulation guarantee: The Study Report stated that the test product was GLP characterized and the information on guarantee, purity, composition, and stability is on file at Syngenta

Crop Protection, Inc. The certificate of analysis was not provided in the Study Report; however it was stated that the assay of the test product showed that the product was made up of 40.2% mesotrione (wt/wt) or 484.4 g/L.

Purity: The Study Report stated that the reference standard was GLP characterized and the information on guarantee, purity, composition, and stability is on file at Syngenta Crop Protection, Inc. The certificate of analysis was not provided in the Study Report.

CAS #(s): 104206-82-8

Other Relevant Information: EPA Reg. No. 100-1131.

## **2. Relevance of Test Material to Proposed Formulation(s):**

The test product delivered to the test site was referred to as Mesotrione 4 SC FR (aka. Mesotrione 480 SC). The product was a suspension concentrate containing 4 lb ai/gal. A product label was not provided with the Study Report; however, Versar was able to obtain a label for Callisto® which appears to be the same product. Callisto® is a suspension concentrate formulation containing 40% mesotrione as the active ingredient and is a postemergence and preemergence herbicide registered for use on corn.

## **B. STUDY DESIGN:**

A study protocol, approved by the sponsor, was provided with the Study Report. The Study Report stated that there were three deviations from the study protocol which included: (1) the size of the calibration plot; (2) the amount of test substance applied to the plot and the amount of carrier (water) used on the plot was different from that described in the protocol; and (3) the pH of the carrier (water) was not measured at the time of the application. According to the Study Report, none of the protocol deviations had an adverse impact on the validity of the study.

### **1. Site Description:**

Test locations: The field portion of the study was conducted in one location. The test site location was near Dallas, North Carolina in Gaston County. The test site consisted of two plots. The first plot did not receive any applications of the test product and was designated as the control plot. The second plot received one application of the test product. The control plot consisted of two rows of corn subdivided into 3 subplots. The treated plot consisted of four rows of corn subdivided into 3 subplots. The distance between the control and the treated plots was not provided in the Study Report.

Areas sprayed and sampled: The treated plot consisted of 4 rows of corn measuring 115 ft by 12.75 ft. for a total of 1,466 ft<sup>2</sup> (0.034 acre).

Meteorological Data: According to the study protocol, daily maximum and minimum air temperatures and relative humidity were to be reported. These meteorological data points were not provided in the Study Report. Environmental conditions at the time of the application were provided in the Study Report. The air temperature was 86°F; the relative humidity was 72% and the wind was reported to be calm. A rain event of 0.75 inches occurred at about 9 hours after the application. No irrigation was applied during the sampling period. Historical weather data were not provided.

2. **Crop Characteristics:**

Crop, variety:	Sweet Corn, <i>Silver Queen</i> variety.
Row width, plant spacing:	The treated plot consisted of 4 rows of corn and the row spacing was 38 inches. There was a 5 foot buffer zone on each end of the treated plot.
Stage of growth:	The crop growth stage at the time of the application was listed as immature. Crop height was 30 inches.
Other products used on crop:	According to the study protocol, the farmer cooperator was to supply information on the use of maintenance chemicals or pesticides prior to the application of the test product. The Study Report made no mention of other products being used at this test site.

3. **Application Rates and Regimes:**

Application rate(s): According to the Study Report, the maximum label recommended application rate for use on turf grass was used as the target application rate in this study (8 fl oz product/A or 0.25 lb ai/A). This rate is higher than that recommended for use on corn. The treated plot received one application of the test product at a rate of 0.23 lb ai/A. The volume of carrier/test substance was used to calculate the actual rate of application.

Application Regime: One over the top backpack handboom sprayer application of mesotrione, was made at the test site. The application was made on June 24, 2007.

Application Equipment: The application was performed using a pre-calibrated research CO<sub>2</sub> backpack handboom sprayer. The backpack sprayer had a capacity of 3 gallons and was attached to a 141 inch boom with eight T-Jet 8001 nozzles. The pressure at the nozzle was 50 psi.

Spray Volume: The target spray volume was 40 gallons per acre (GPA). The actual spray volume was 36.4 GPA. The application was made using 76 mL of Crop Oil Concentrate (COC) as a spray adjuvant.

Equipment Calibration Procedures: Calibration at the test site was performed according to H.E.R.A.C., Inc. SOP HERAC-2AB/4. The output of each nozzle was measured three times to ensure that delivery volume was within 10% across the spray boom. Calibration of the backpack sprayer included walking and spraying water for a specified distance and time over a calibration plot. Detailed calibration information was provided in the Study Report.

4. **Dislodgeable Foliar Residue Sampling Procedures:**

Method and equipment: Samples were collected with a 2.54 cm diameter Birkestrand leaf punch. Pre-labeled glass jars were attached to the leaf puncher.

Sampling procedure: Leaf discs were collected using a hand-held Birkestrand mechanical leaf puncher. A single leaf disc was punched directly into an attached glass jar allowing for the corn leaf discs to be collected without being touched. The field technician worked systematically through each subplot taking several leaf punches from the same plant. The 40 leaf disc samples were taken from a total of about 6 to 10 plants scattered throughout the subplot.

Surface area sampled (two sides): The double sided surface area per leaf disc was approximately 10.14 cm<sup>2</sup>.

Total surface area per replicate: The total double sided surface area per replicate was approximately 405 cm<sup>2</sup> (40 discs x 10.14 cm<sup>2</sup> each).

Replicates per activity:

– Replicates per sampling time: Triplicate DFR samples were collected from the plots at each of the designated treated and untreated sampling intervals.

– Number of sampling times: There were a total of 10 sampling events from the treated plot and three sampling events from the untreated plot.

Times of sampling: Treated leaf punch samples were collected 2, 3, 4, 5, 6, 7, 8, 24, 48 and 72 hours after the application. Control leaf punch samples were collected prior to the application to the treated plot, on day 1 after treatment and on day 3 after treatment.

Part(s) of foliage sampled: The discs were collected from leaves attached to the bottom, middle and top of the plants. Each leaf disc was punched from the center of the leaf.

## 5. Sample Handling:

The leaf punch discs were collected directly into pre-labeled glass jars. Immediately after collection, the sample jars were removed from the puncher and capped with Teflon lined lids. After capping, the jars were placed into a field cooler for temporary storage prior to dislodging. Separate coolers were used for nontreated and treated samples and each cooler contained artificial “blue” ice. The leaf disc samples were dislodged within one hour of collection. The dislodged samples were capped and immediately placed into a freezer at a 45° angle until frozen. The frozen field samples were transported on dry ice in coolers via a H.E.R.A.C., Inc. van to Syngenta Crop Protection, Inc, where they were stored frozen until they were extracted and analyzed.

## 6. Analytical Methodology:

Dislodging solution: 0.01% Aerosol® OT rinse solution

Dislodging procedure: Approximately 100 mL of a 0.01% aqueous detergent (Aerosol® OT) was added to each sample jar and mechanically shaken at approximately 200 cycles per minute for approximately 10 minutes. This solution was decanted into a second sample jar, and the leaf punch samples were washed again with 100 mL of the detergent solution. This solution was decanted into the same jar as the first rinse and the sample jars containing the combined dislodging solution were

capped and placed into frozen storage.

Time interval (sample collection to dislodging): All samples were dislodged within one hour of collection.

Extraction method: The analytical method used for the analysis of mesotrione residues in DFR wash samples used direct aqueous injection. Therefore, this method did not require an extraction procedure.

Detection methods: All samples were analyzed by LC/MS/MS in order to quantitate mesotrione. A summary of the instrumentation conditions are shown in Table 1.

<b>Table 1. Summary of Typical LC/MS/MS Conditions</b>													
HPLC:	Perkin Elmer Series 200												
Column:	Zorbax SB-AQ, 4.6 × 50 mm, 3.5 micron particle size												
Column Filter:	ColumnSaver (MAC-MOD P/N MMCS210)												
Flow Rate:	0.5 mL/min												
Column Temperature:	25°C												
Injection Volume:	50 µL												
Mobile Phase:	A = 0.1% formic acid in water B = 0.1% formic acid in Acetonitrile  <table border="1"> <thead> <tr> <th>Time (min)</th><th>Composition</th></tr> </thead> <tbody> <tr> <td>0.0</td><td>95% A + 5% B at 0.5 mL/min</td></tr> <tr> <td>2.0</td><td>5% A + 95% B</td></tr> <tr> <td>3.0</td><td>5% A + 95% B at 1.0 mL/min</td></tr> <tr> <td>4.0</td><td>95% A + 5% B</td></tr> <tr> <td>6.0</td><td>95% A + 5% B</td></tr> </tbody> </table>	Time (min)	Composition	0.0	95% A + 5% B at 0.5 mL/min	2.0	5% A + 95% B	3.0	5% A + 95% B at 1.0 mL/min	4.0	95% A + 5% B	6.0	95% A + 5% B
Time (min)	Composition												
0.0	95% A + 5% B at 0.5 mL/min												
2.0	5% A + 95% B												
3.0	5% A + 95% B at 1.0 mL/min												
4.0	95% A + 5% B												
6.0	95% A + 5% B												
MS/MS Instrumentation	Applied Biosystems/MDS Sciex API 4000 triple quadrupole												
Ionization:	Electrospray (Positive and Negative mode)												
Desolvation Temperature:	700 °C												
IonSpray Voltage:	5500 volts in positive mode 4500 volts in negative mode												

Method validation: A direct inject aqueous analytical method was employed for the analysis of mesotrione in corn leaf disc wash samples. Syngenta Method T001681-06 was entitled "Analytical Method for the Determination of Atrazine, Simazine, Propazine, G-30033, G-28279, G-28273, Ametryn, Prometryn, GS-11354, GS-11355, GS-26831, S-Metolachlor, Metolachlor-ESA, Metolachlor-OA and Mesotrione in Water Using direct-Aqueous-Injection ESI-LC/MS/MS, Including Validation Data." This method was validated prior to the analysis of the field samples collected in this study. The method validation was conducted at the LOQ and 10XLOQ for mesotrione. The overall average recovery was 114% ± 7.65%

(n=6) for mesotrione in corn leaf disc wash samples. The validated limit of quantification (LOQ) for mesotrione residues in dislodging solution was 0.1 ng/mL, equivalent to 0.00005 µg/cm<sup>2</sup>.

Instrument performance: Each set of samples analyzed included one control and two concurrent laboratory recovery samples. Correlation coefficients from weighted (1/x) standard calibration curves generated for each reported analysis set were at least 0.990. Analysis results were not reported if the correlation coefficients fell below this value.

Quantification: Quantitation of residues in all samples was achieved using an external calibration curve calculated by linear regression of instrument responses for the reference substance at multiple concentrations.

## 7. Quality Control:

Lab Recovery: Each set of samples was run with one blank control and two fortified controls which were fortified at 0.10 ppb (0.10 ng/mL) and 1.0 ppb (1.0 ng/mL). The samples were analyzed concurrently with the field samples in order to determine the efficiency of the method. Concurrent laboratory recoveries for all fortification levels ranged from 98.3% to 119% with an overall mean recovery of 108% ± 8.62% (n=8). The Study Report did not provide the actual amount of mesotrione found in the concurrent laboratory samples; therefore, Versar could not verify the accuracy of the percent recoveries reported.

Field blanks: Triplicate control samples were collected from the control plot and the treated plot one day prior to the application. Additional triplicate control samples were collected from the control plot on Day 1 and Day 3 after the application to the treated plot. Residues of mesotrione were not detected above the LOQ (0.00005 µg/cm<sup>2</sup>) in any of the control samples.

Field recovery: Field fortification samples were prepared the day prior to the application of the test substance to measure the extractability and stability of mesotrione. Triplicate samples of control dislodging solution were fortified with 0.5 (0.5 ng/mL or 5XLOQ), 10 (10 ng/mL or 10XLOQ) and 100 ppb (100 ng/mL or 100XLOQ) of mesotrione. These samples were stored and analyzed with the field samples.

The overall mean field fortification recovery was 101% ± 4.26% Table 2 provides a summary of the field fortification recoveries. The Study Report did not provide the actual amount of mesotrione found in the concurrent laboratory samples or in the field fortification samples, therefore, Versar could not verify the accuracy of the percent recoveries reported.

The field fortification levels encompassed the range of values determined in the field samples.

Table 2. Field Fortification Recoveries for Mesotrione				
Fortification Level (ppb)	Recovery (%)	Average Recovery (%)	Overall Average Recovery (%)	Std. Dev.
0.5 <sup>1</sup>	97.6	97.9	101	4.26
	96.1			
	100			
10 <sup>2</sup>	100	99.8		
	101			
	98.4			
100 <sup>2</sup>	107	105		
	100			
	109			

Note: Actual field fortification levels found were not provided in the Study Report.

1. Samples run undiluted
2. Samples run on a 1:400 dilution

Formulation: The test product, Mesotrione 480 SC, was analyzed and certified to contain 42% (w/w) mesotrione as the active ingredient.

Tank mix: Tank mix analysis was not conducted as part of this study.

Travel Recovery: Travel recovery samples were not used in this study.

Storage Stability: The field recovery samples were stored, and shipped under the same conditions as the field samples and were used to provide stability data for the treated samples. The samples were stored for a maximum of 9 days prior to analysis. According to the analytical report, the field fortification samples were the last samples analyzed. The overall average field fortification recovery was 101%  $\pm$  4.26% (n=9) which demonstrates stability during handling and transport from the field and storage at the laboratory.

## II. RESULTS AND CALCULATIONS

The Registrant calculated individual residue data in  $\mu\text{g}/\text{cm}^2$  for each of the sampling intervals. Field samples from the 2, 3, 4, 5, 6, 7, and 8 hour sampling intervals as well as the field fortification samples were diluted by 400 fold prior to analysis. The 24-hour to 72-hour samples were analyzed without dilution. The overall average field fortification recovery was greater than 90%; therefore the raw residue data did not require correction. None of the raw residue values from the treated test site dropped below the limit of quantitation.

The maximum mean DFR for corn leaves occurred three hours after the application ( $0.375 \mu\text{g}/\text{cm}^2$ ) and declined to  $0.261 \mu\text{g}/\text{cm}^2$  eight hours after the application. Three quarters of an inch of rain fell soon after the 8 hour sampling interval. The mean DFR then dropped rapidly to  $0.00068 \mu\text{g}/\text{cm}^2$  by the 24 hour sampling interval. The lowest mean DFR occurred at the Day 2 (48-hour) sampling interval ( $0.00054$

$\mu\text{g}/\text{cm}^2$ ). Residue on the final sampling interval, Day 3 (72 hour), averaged slightly higher at 0.00077  $\mu\text{g}/\text{cm}^2$ .

The Registrant performed a regression analysis using a dissipation function to describe the DFR at any given time. It was assumed the decay process followed a monotonically decreasing curve which is exponential in nature. DFR values at 24, 48, and 72 hours after application were omitted from the regression analysis due to a significant rainfall event (0.75 inches) which occurred shortly after the 8 hour sampling interval. There was a dramatic decrease in DFRs after the 8 hour samples most likely were due to the rainfall. Therefore, to be conservative, the Registrant did not include the sampling data from the samples collected after the rainfall in their regression analysis calculation. The Registrant estimated a half-life value of 10.5 hours (0.438 days) with an  $R^2$  of 0.9161. By plotting all the individual data points for each sampling interval, Versar estimated a half-life value of 9.1 hours (0.38 days) with an  $R^2$  of 0.30 for corn leaves out to 8-hours after application. This low  $R^2$  value was due to the variability of residue values within each sampling interval. Versar plotted a regression using the average residue value for each sampling interval. These results duplicated the Registrant's findings.

A graphical representation of mesotrione residue dissipation is presented in Figure 1. Table 3 provides a summary of the mesotrione DFR values determined on the corn leaves.

The percentage of residue on the corn leaf that was dislodgeable at each sampling interval was also examined. The actual application rate of 0.23 lb ai/A was converted to 2.58  $\mu\text{g}/\text{cm}^2$  to aid in calculation of the percentage of the original application rate that was dislodgeable. Approximately 14.5% of the application rate was dislodgeable at the 2 hour sampling interval. As stated by the Registrant, this is less than the EPA default assumption of 20% for children's object to mouth transfer currently used in residential risk assessments (2001, EPA's Scientific Advisory Council – Policy 12).

### **III DISCUSSION:**

#### **A. LIMITATIONS OF THE STUDY:**

This study met the most of the Series 875.2100 Guidelines. The following issues of concern are noted:

- The main objective of the study was to determine the percentage of mesotrione that could be dislodged immediately after application, and because only one test site was used in the study only three replicates were examined at each time interval.
- The samples of most concern (those in the first hours after application) required a dilution factor of 400 in order to be quantifiable in the validation range of the method.
- Rainfall (i.e., 0.75 inches) occurred within 9 hours of the application. To be conservative, the Registrant did not use the data collected after the rainfall event in the DFR regression analysis.
- Complete meteorological data were not provided for the duration of the study, such as daily temperature, wind speed, wind direction, and relative humidity.
- The production of metabolites, breakdown products, or the presence of contaminants of concern, was not addressed for mesotrione.
- Control sites should be upwind and a reasonable distance from the treatment site. The location of the control plot relative to the location of the treated plot was not discussed in the Study Report.

**B. CONCLUSIONS:**

The objective of this study was to provide information on the dislodgeability of mesotrione from plant turf blades using corn as a surrogate crop. The percent of mesotrione dislodgeable at the 2 hour sampling interval was 14.5% of the original application rate, and 14.6% at the 3 hour sampling interval. By the 8 hour sampling interval the dislodgeable percentage of mesotrione dropped to 10.1% of the original application rate.

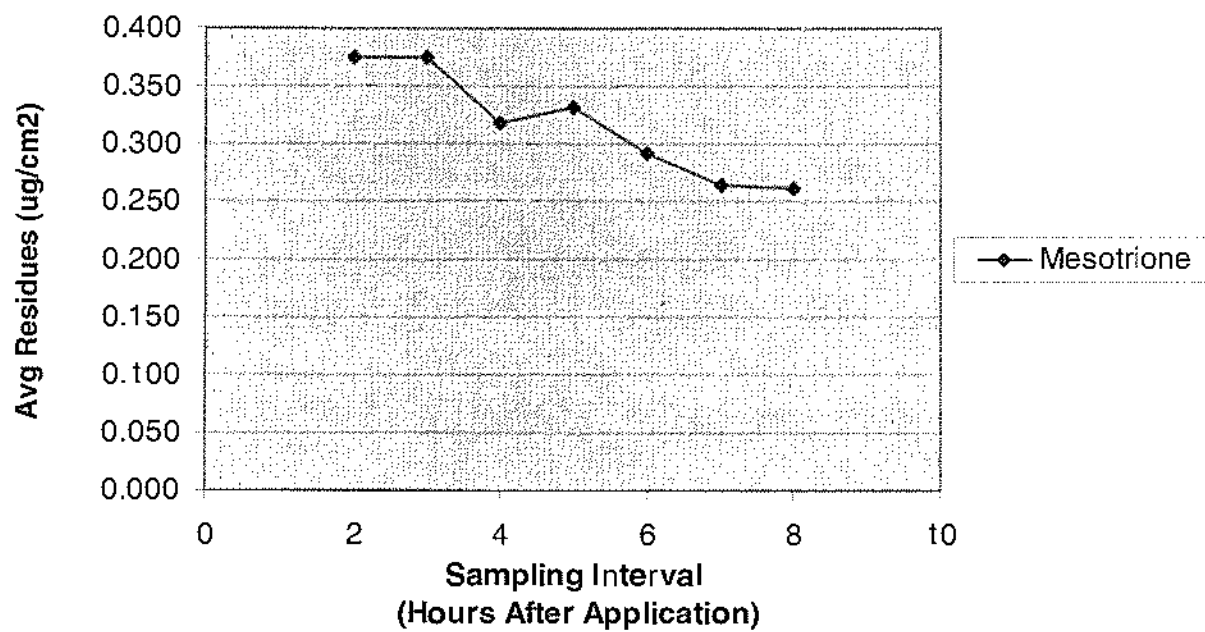
Table 3. Dislodgeable Foliar Residue of Mesotrione On Corn Plants								
Post Application Sample Interval (Day)	Mesotrione <sup>1,2</sup> DFR (µg/sample)	Mesotrione DFR (µg/cm <sup>2</sup> )	Mesotrione DFR (µg/cm <sup>2</sup> )	Arithmetic Mean (µg/cm <sup>2</sup> )	Standard Deviation (µg/cm <sup>2</sup> )	Coefficient of Variance (%)	Percent of Original Application Rate Dislodgeable	
2-hr (Day 0.083)	128	0.316	0.316	0.374	0.108	28.9	14.5 n=3	
	125	0.308	0.308					
	173	0.427	0.499 <sup>3</sup>					
	216	0.533						
	218	0.537						
3-hr (Day 0.125)	157	0.387	0.387	0.375	0.013	3.45	14.6 n=3	
	146	0.361	0.361					
	153	0.377	0.377					
4-hr (Day 0.167)	71	0.174	0.314 <sup>4</sup>	0.319	0.005	1.64	12.4 n=3	
	158	0.391						
	152	0.375						
	131	0.324						0.324
	129	0.318						0.318
5-hr (Day 0.208)	116	0.286	0.286	0.333	0.045	13.7	12.9 n=3	
	135	0.334	0.334					
	153	0.377	0.377					
6-hr (Day 0.250)	118	0.292	0.292	0.292	0.093	31.9	11.3 n=3	
	80	0.198	0.199 <sup>5</sup>					
	85	0.209						
	77	0.189						
	156	0.385						0.385
7-hr (Day 0.292)	80	0.198	0.196 <sup>6</sup>	0.264	0.070	26.5	10.2 n=3	
	84	0.207						
	74	0.183						
	136	0.336	0.336					
	106	0.261	0.261					
8-hr (Day 0.333)	118	0.292	0.292	0.261	0.113	43.3	10.1 n=3	
	144	0.356	0.356					
	58	0.142	0.136 <sup>7</sup>					
	54	0.134						
	53	0.132						
24-hr (Day 1)	0.292	0.00072	0.00072	0.00068	0.00007	10.3	0.03 n=3	
	0.290	0.00072	0.00072					
	0.242	0.00060	0.00060					
48-hr (Day 2)	0.053	0.00013	0.00013	0.00054	0.00061	112	0.0 n=3	
	0.106	0.00026	0.00026					
	0.502	0.00124	0.00124					
72-hr (Day 3)	0.510	0.00126	0.00126	0.00077	0.00047	61.8	0.03 n=3	
	0.298	0.00074	0.00074					
	0.126	0.00031	0.00031					

Notes:

1. Samples from 2 to 8 hour time interval were diluted 400 times.

2. Samples from 24, 48, and 72 hours were not diluted before analysis
3. The three R3 replicate analytes from the 2-hour interval were averaged and this value was then averaged with R1 and R2 analyses.
4. The three R1 replicate analytes from the 4-hour interval were averaged and this value was then averaged with R2 and R3 analyses.
5. The three R2 replicate analytes from the 6-hour interval were averaged and this value was then averaged with R1 and R3 analyses.
6. The three R1 replicate analytes from the 7-hour interval were averaged and this value was then averaged with R2 and R3 analyses.
7. The three R3 replicate analytes from the 8-hour interval were averaged and this value was then averaged with R1 and R2 analyses.

**Figure 1. Average Mesotrione Residues from  
Corn Treated with Mesotrione 480 SC**



## APPENDIX A

### **Compliance Checklist for “*Pilot Study: Dissipation of Dislodgeable Foliar Residues of Mesotrione 480 SC Formulation Applied to Corn*”**

**Compliance Checklist for " Pilot Study: Dissipation of Dislodgeable Foliar Residues of Mesotrione 480 SC Formulation Applied to Corn."**

Compliance with OPPTS Series 875, Occupational and Residential Exposure Test Guidelines, Group B: Postapplication Exposure Monitoring Test Guidelines, Dislodgeable Foliar Residue Dissipation: Agricultural, 875.2100 is critical. The itemized checklist below describes compliance with the major technical aspects of OPPTS 875.2100.

- *The test substance must be the typical end use product of the active ingredient.* This criterion was met.
- *The production of metabolites, breakdown products, or the presence of contaminants of concern, should be considered in the study design on a case-by-case basis.* It is not certain if this criterion was met. The Study Report did not address metabolites or breakdown products of mesotrione.
- *Applications should occur at the time of season that the end-use product is normally applied to achieve intended pest control.* This criterion was met.
- *Initiating testing immediately before a precipitation event should be avoided.* This criterion was not met. Rainfall occurred 9 hours after the application; however, data recorded after the rainfall event was not used in the regression analysis.
- *The end use product should be applied by the application method recommended for the crop. Information that verifies that the application equipment (e.g., sprayer) was properly calibrated should be included.* These criteria were met.
- *The application rate used in the study should be provided and should be the maximum rate specified on the label. However, monitoring following application at a typical application rate is more appropriate in certain cases.* This criterion was met. The application rate used in this study exceeded the maximum label recommended application rate for corn. However, the application rate used in this study was the label recommended maximum application rate for turf.
- *If multiple applications are made, the minimum allowable interval between applications should be used.* This criterion was not met. Only one application was made.
- *Dislodgeable foliar residue (DFR) data should be collected from at least three geographically distinct locations for each formulation and crop type. The sites should be representative of the regions (and crops) where the chemical is used.* These criteria were not met. Only one test site was used. The study was performed as a pilot study for the purpose of determining the transfer of mesotrione from leaf material immediately following an application using corn as a surrogate crop for turf. A total of only three samples were analyzed for each time period.
- *The site(s) treated should be representative of reasonable worst-case climatic conditions expected in intended use areas Meteorological conditions including temperature, wind speed, daily rainfall, and humidity should be provided for the duration of the study.* This criterion was partially met. It is not certain if the site chosen was representative of reasonable worst-case climatic conditions. Temperature, wind speed, rainfall and humidity were only provided for the day of application. Weather conditions were not provided for the duration of the study.
- *Sampling should be sufficient to characterize the dissipation mechanisms of the compound (e.g., three half-lives or 35 days after the final application, unless the compound has been found to fully dissipate*

*in less time; for more persistent pesticides, longer sampling periods may be necessary). Sampling intervals may be relatively short in the beginning and lengthen as the study progresses. Background samples should be collected before application of the test substance occurs. This criterion was met, especially considering the purpose was to examine residues in the time period immediately after application.*

- *Triplicate, randomly collected samples should be collected at each sampling interval. This criterion was met, however with only one test location, a total of only three samples were examined for each time period*
- *A leaf punch apparatus should be used unless the nature of the crop precludes its use. Samples should represent at least an area of 400 cm<sup>2</sup>. This criterion was met. The total surface area per replicate was approximately 405 cm<sup>2</sup>.*
- *Control plots should be established from which sufficient control samples can be collected. Control sites should be upwind and a reasonable distance from the treatment site. These criteria were partially met. The location of the control plot relative to the location of the treated plot was not discussed in the Study Report.*
- *Residues should be dislodged from leaf surfaces using an aqueous surfactant solution within a reasonable time period (i.e., EPA recommends that dislodging occur within 4 hours). Dislodging should be repeated at least once and the resultant solutions pooled for analysis. This criterion was met.*
- *Samples should be stored in a manner that will minimize deterioration and loss of analytes between collection and analysis. Information on storage stability should be provided. These criteria were mostly met. The Registrant stated that the field fortification recoveries supported the stability of mesotrione in frozen storage. A formal storage stability study was not performed.*
- *Validated analytical methods of sufficient sensitivity are needed. Information on method efficiency (residue recovery), and limit of quantitation (LOQ) should be provided. These criteria were met. The limit of quantitation (LOQ) of the method was 0.00005 µg/cm<sup>2</sup>. However, the method was validated for sample residue levels much lower than actual field sample levels. The field samples required a 1:400 dilution to be within the range of the instrument.*
- *Information on recovery samples must be included in the study report. A complete set of field recoveries should consist of at least one blank control sample and three or more each of a low-level and high-level fortification. These fortifications should be in the range of anticipated residue levels in the field study. This criterion was met.*
- *Raw residue data must be corrected if appropriate recovery values are less than 90 percent. This criterion did not apply. Raw residue data did not require correction for field fortification recoveries.*
- *Dislodgeable foliar residues should be reported as mg or µg per m<sup>2</sup> or cm<sup>2</sup> of leaf sampled. Distributional data should be reported, to the extent possible. This criterion was met.*

## **APPENDIX B**

### **Regression Analysis for Mesotrione 480 SC Formulation Applied to Corn**

#### **2-hrs to 8-hrs Regression Analysis**

Regression Analysis: Summary Output for Shortened Mesotrione DFR

Regression Statistics	
Multiple R	0.547744
R Square	0.300023
Adjusted R2	0.263182
Standard Error	0.241793
Observations	21

ANOVA						
	df	SS	MS	F	Signif. F	
Regression	1	0.476114	0.476114	8.1437594	0.010159056	
Residual	19	1.110809	0.058464			
Total	20	1.586923				
	Coeff.	Std. Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	-0.80655	0.142105	-5.67571	1.799E-05	-1.103974222	-0.509116937
Slope	-1.80738	0.633341	-2.85373	0.0101591	-3.132981231	-0.481784188

Half Life = 0.383509 Days

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0.083	0.316	0.374	0.108	28.9
	0.308			
	0.499			
0.125	0.387	0.375	0.013	3.45
	0.361			
	0.377			
0.167	0.314	0.319	0.00522	1.64
	0.324			
	0.318			
0.208	0.286	0.333	0.0454	13.6
	0.334			
	0.377			
0.250	0.292	0.292	0.0932	31.9
	0.199			
	0.385			
0.292	0.196	0.264	0.0699	26.5
	0.336			
	0.261			
0.333	0.292	0.261	0.113	43.4
	0.356			
	0.136			

# Regression Analysis: Log of Dislodgeable Foliar Residue vs. Time for Shortened Mesotrione DFR

